

[54] INTEGRATED HEATER ALKALI VAPOR LAMP

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[51] Int. Cl.² H01J 1/02

[58] Field of Search 313/15, 44

[56] References Cited

UNITED STATES PATENTS

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[57] ABSTRACT

An alkali vapor lamp which may be operated in the open atmosphere has integrated heaters mounted in evacuated ceramic shrouds positioned at each end of the lamp. A thermocouple is positioned within one of the shrouds. Circuit connections to the heaters, the electrodes and to the thermocouple are made via ceramic socket ends, thus permitting rapid replacement of the lamp in the event that the lamp fails.

9 Claims, 2 Drawing Figures

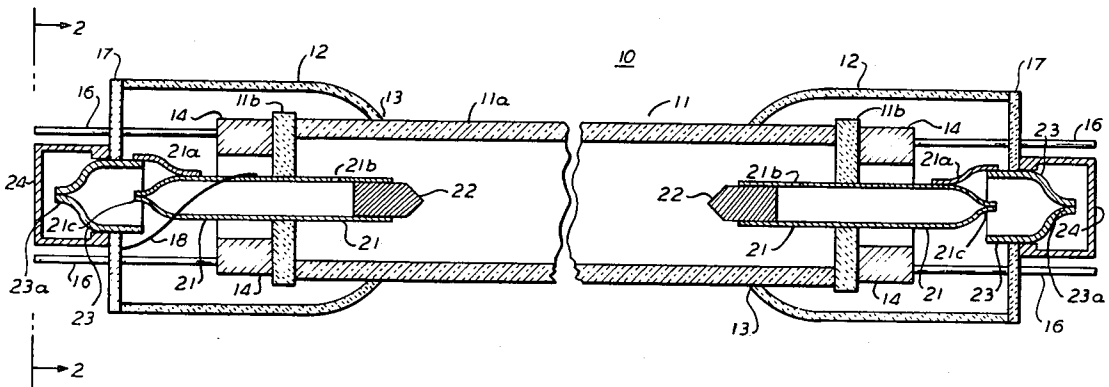


FIG. 1

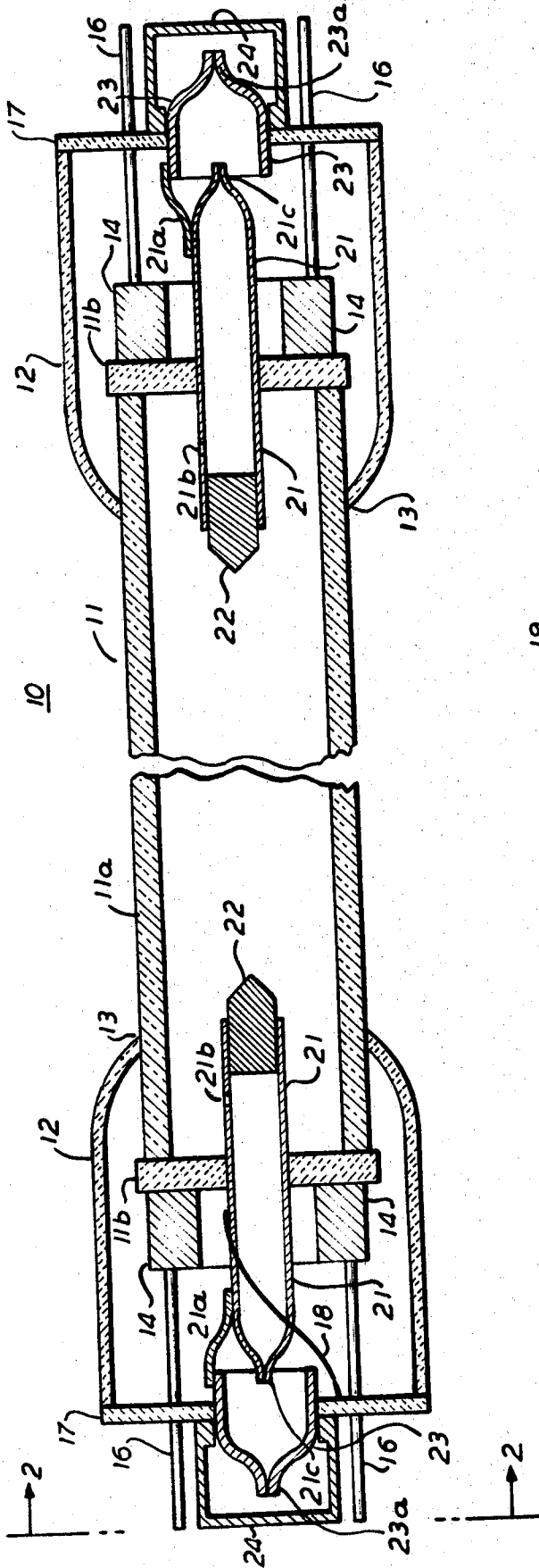
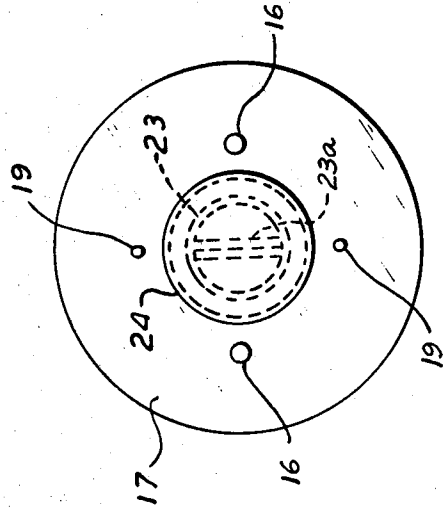


FIG. 2



INTEGRATED HEATER ALKALI VAPOR LAMP

The invention described herein may be manufactured and used by or for the Government for governmental purposes without the payment of any royalties thereon or therefor.

BACKGROUND OF THE INVENTION**1. Field of the Invention**

Broadly speaking, this invention relates to alkali vapor lamps and the like. More particularly, in a preferred embodiment, this invention relates to an alkali vapor lamp having integrated end-cap heaters associated therewith.

2. Discussion of the Prior Art

Alkali vapor lamps are widely used in industry for such diverse purposes as laser pumps, searchlights, street and parking lot illumination, etc. These lamps are characterized by high efficiency, high light output, and high operating temperatures (for example greater than 180°C).

If operated in the open atmosphere, the metallic connections to the heaters, and indeed the heaters themselves, quickly become oxidized and must be replaced at impractically frequent intervals. To overcome this difficulty, such lamps in the past have been operated within an evacuated housing or optical head. However, this also leads to difficulties because the optical head must be disassembled whenever the lamp is changed, frequently causing the connections to the heater coils and other devices, such as temperature monitoring thermocouples, to fail due to repeated stress. Also, lamps which are operated in an evacuated housing have been known to fail when gases, evolving from the internal parts of the lamp and housing and from leaks in the enclosure walls, collect inside the housing causing oxidation of the metal parts which are at high temperatures.

The problem then is the provision of an alkali vapor lamp which may be operated in the open atmosphere without the need to completely enclose the lamp in an evacuated chamber or the like so that it is relatively easy to replace when spent.

SUMMARY OF THE INVENTION

These, and other problems, have been solved by the instant invention which, in a preferred embodiment, comprises a transparent cylindrical envelope for containing an alkali vapor. An electrode is provided at each end of the envelope as is an evacuated chamber. Finally, at least one heating element is positioned within the chamber to heat the envelope and thereby establish the needed alkali vapor.

The invention and its mode of operation will be more clearly understood from the following detailed description when read with the appended drawing in which:

DESCRIPTION OF THE DRAWING

FIG. 1 is a cross-sectional view of an alkali vapor lamp according to the invention; and

FIG. 2 is an end view of the lamp shown in FIG. 1.

DETAILED DESCRIPTION OF THE INVENTION

As shown in FIG. 1, lamp 10 comprises an envelope 11 which is filled with an alkali vapor, such as sodium, potassium, cesium, rubidium, etc. and a starter gas such as argon or xenon. The envelope 11 comprises a trans-

parent cylinder 11a, for example, of sapphire which is sealed at both ends by ceramic end caps 11b.

At both ends of lamp 10, an evacuated, ceramic shroud 12 is positioned about each end of envelope 11. A ceramic-to-sapphire seal 13 about the circumference of envelope 11 maintains the integrity of the vacuum within shrouds 12 at the envelope ends. A pair of end-cap heating elements 14 are positioned within shrouds 12, proximate the ends of envelope 11.

Heating elements 14 are advantageously potted in ceramic, but may also be wound on a ceramic mandrel, for example. Electrical connections for the heating elements are made via metallic pins 16 extending outwardly through a ceramic socket 17 integral with and sealed to shroud 12. At one end of the lamp, a thermocouple 18, for example a Cr-Al thermocouple, is positioned proximate the heating elements 14 to monitor the temperature of the lamp. Electrical connections to thermocouple 18 are made by a second pair of metallic pins 19, as seen in FIG. 2. Only one of the leads of thermocouple 18 is shown in FIG. 1, the other lead being in back of the electrode assembly structure. A second thermocouple could be mounted at the other end of the lamp if desired.

A metal tubulation 21 extends into each end of the evacuated sapphire envelope 11 through end caps 11b and is sealed thereto. A hole 21b in at least one tubulation 21 is used during manufacture to evacuate the envelope 11. After evacuation of envelope 11, an alkali metal and starter gas are introduced therein also via tubulation 21 and hole 21b. The envelope 11 is then sealed by crimping the ends 21c of tubulations 21 as shown in FIG. 1. The tubulations 21, which may advantageously be electron-beam welded, mount the lamp electrodes 22. The shrouded ends are evacuated during manufacture through second, larger tubulations 23 which are subsequently crimped at 23a and then covered by metal caps 24. Electrical connection to electrodes 22 is made via tubulations 21, metal straps 21a connecting to larger tubulations 23 and caps 24.

As mentioned, shrouds 12 are sealed to envelope 11 and to the sockets 17. However, shrouds 12 could be fabricated as integral parts of envelope 11, if desired, thus eliminating a sealing step. Also, thermocouple 18 could be potted in ceramic together with the respective heater element 14 or positioned in intimate contact with the fill tubulation 21.

The invention disclosed herein may be used with equal success with metal halide lamps such as potassium, cesium, rubidium, iodides, cerium, etc. Also, where there are two tubulations 21, one at each end of the lamp as shown, one tubulation can be used to admit the alkali vapor while the other can be sealed.

One skilled in the art may make various substitutions and changes to the arrangement of parts shown without departing from the spirit and the scope of the invention.

What is claimed is:

1. An alkali vapor lamp, which comprises:
 - a transparent, cylindrical envelope for containing said alkali vapor;
 - an electrode at each end of said envelope;
 - an evacuated chamber at each end of said envelope and in engagement therewith; and
 - at least one heating element in each of said chambers for heating said envelope, thereby to establish the alkali vapor in said lamp.

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2. The lamp according to claim 1 wherein each of said evacuated chambers is integral with said envelope.

3. The lamp according to claim 1 wherein each of said evacuated chambers is comprised of ceramic, each of said chambers being circumferentially bonded at one end to said envelope.

4. The lamp according to claim 1 further comprising a thermocouple in at least one of said chambers to monitor the temperature of said lamp.

5. The lamp according to claim 4 wherein each of said chambers includes an integral ceramic socket having a plurality of metallic pins extending outwardly therefrom through which connection may be made to the electrode at the same end of said envelope and to the respective heating element and thermocouple.

6. The lamp according to claim 5 further comprising a metallic tubulation extending into one end of said envelope for introducing said alkali vapor therein, said tubulation also serving to mount that one of said electrodes at the same end of said envelope and providing the electrical connection between said mounted electrode and the corresponding pin on said ceramic socket.

7. The lamp according to claim 5 wherein said heating element is potted in ceramic.

8. The lamp according to claim 5 wherein said heating element is wound on a ceramic mandrel.

9. The lamp according to claim 5 wherein said envelope is comprised of sapphire.

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